Claims:

What is claimed is:

Claim 1

A system for embedding additional information in compressed audio data comprising:

(1) means for extracting MDCT coefficients from said compressed audio data;

(2) means for employing said MDCT coefficients to calculate a frequency component for said compressed audio data;

(3) means for embedding additional information in said frequency component obtained in a frequency domain;

(4) means for transforming into MDCT coefficients said frequency component in which said additional information is embedded; and

(5) means for using said MDCT coefficients, in which said additional information is embedded, to generate compressed audio data.

Claim 2

A system for updating additional information embedded in

compressed audio data comprising:

(1) means for extracting MDCT coefficients from said compressed audio data;

(2) means for employing said MDCT coefficients to calculate a frequency component for said compressed audio data;

(3) means for detecting said additional information in said frequency component that is obtained;

(3-1) means for changing, as needed, said additional information for said frequency component;

(4) means for transforming into MDCT coefficients said frequency component in which said additional information is embedded; and

(5) means for using said MDCT coefficients, in which said additional information is embedded, to generate compressed audio data.

Claim 3

A system for detecting additional information embedded in compressed audio data comprising:

(1) means for extracting MDCT coefficients from said compressed audio data;

(2) means for employing said MDCT coefficients to calculate a frequency component for said compressed audio data; and

(3) means for detecting said additional information in said frequency component that is obtained.

Claim 4

The system according to claim 1, wherein said means (2) calculates said frequency component for said compressed audio data using a precomputed table in which a correlation between MDCT coefficients and frequency components is included.

Claim 5

The system according to claim 1, wherein said means (4) transforms said frequency component into said MDCT coefficients by using a precomputed table that includes a correlation between MDCT coefficients and frequency components.

Claim 6

The system according to claim 1, wherein said means (3) for embedding said additional information in said frequency domain divides an area for embedding one bit by the time domain, and calculates a signal level for each of the

individual obtained area segments, while embedding said additional information in said frequency domains in accordance with the lowest signal level available for each frequency.

Claim 7

For at least one window function and one window length employed for compressing audio data, a method for generating a table including a correlation between MDCT coefficients and frequency components comprising the steps of:

(1) generating a basis which is used for performing a Fourier transform for a waveform along a time axis;

(2) multiplying a window function by a corresponding waveform that is generated by using said basis;

(3) performing an MDCT process, for the result obtained by the multiplication of said window function, and calculating an MDCT coefficient; and

(4) correlating said basis and said MDCT coefficient.

Claim 8

The table generation method according to claim 7, wherein, at said step (2) for multiplying said corresponding window function, a periodicity of said basis is employed to prevent

generation of a redundant correlation between a frequency component and an MDCT coefficient.

Claim 9

The table generation method according to claim 7, wherein, at said step (2) for multiplying said corresponding window function, said basis is divided into several segments, and corresponding window functions are multiplied for several of said segments, so that a redundant correlation between a frequency component and an MDCT coefficient is not generated.

Claim 10

A method for embedding additional information in compressed audio data comprising the steps of:

(1) extracting MDCT coefficients from said compressed audio data;

(2) employing said MDCT coefficients to calculate a frequency component for said compressed audio data;

(3) embedding additional information in said frequency component obtained in a frequency domain;

(4) transforming into MDCT coefficients said frequency component in which said additional information is embedded;

and

(5) using said MDCT coefficients, in which said additional information is embedded, to generate compressed audio data.

Claim 11

A method for updating additional information embedded in compressed audio data comprising the steps of:

(1) extracting MDCT coefficients from said compressed audio data;

(2) employing said MDCT coefficients to calculate a frequency component for said compressed audio data;

(3) detecting said additional information in said frequency component that is obtained;

(3-1) changing, as needed, said additional information for said frequency component;

(4) transforming into MDCT coefficients said frequency component in which said additional information is embedded; and

(5) using said MDCT coefficients, in which said additional information is embedded, to generate compressed audio data.

Claim 12

A method for detecting additional information embedded in compressed audio data comprising the step of:

(1) extracting MDCT coefficients from said compressed audio data;

(2) employing said MDCT coefficients to calculate a frequency component for said compressed audio data; and

(3) detecting said additional information in said frequency component that is obtained.

Claim 13

The method according to claim 10, wherein, at said step (2), said frequency component is calculated for said compressed audio data using a precomputed table in which a correlation between MDCT coefficients and frequency components is included.

Claim 14

The method according to claim 10, wherein, at said step (4), said frequency component is transformed into said MDCT coefficients by using a precomputed table that includes a correlation between MDCT coefficients and frequency components.

Claim 15

A computer-readable program storage medium on which a program is stored for executing the table generation method in accordance with claim 7.

Claim 16

A computer-readable program storage medium on which a program is stored for executing the additional information embedding method according to claim 10.

Claim 17

A computer-readable program storage medium on which a program is stored for executing the additional information updating method according to claim 11.

Claim 18

A computer-readable program storage medium on which a program is stored for executing the additional information detection method according to claim 12.

Claim 19

An electronic watermarking apparatus comprising:

an information embedding device for embedding additional information in compressed audio data; and

a detection device for detecting said additional information from said compressed audio data,

said information embedding apparatus including,

(1) means for extracting MDCT coefficients from said compressed audio data,

(2) means for employing said MDCT coefficients to calculate a frequency component for said compressed audio data,

(3) means for embedding additional information in said frequency component obtained in a frequency domain,

(4) means for transforming into MDCT coefficients said frequency component in which said additional information is embedded, and

(5) means for using said MDCT coefficients, in which said additional information is embedded, to generate compressed audio data, and

said detection device including

(1) means for extracting MDCT coefficients from

said compressed audio data,

(2) means for employing said MDCT coefficients to calculate a frequency component for said compressed audio data, and

(3) means for detecting said additional information in said frequency component that is obtained.